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NATIONAL DAM SAFETY PROGRAM. SHAWS MILL POND DAM (NJ00075), ATL--ETC(U)
JUL 81 R J MCDERMOTT, J E GRIBBON DACW61-79-C-0011

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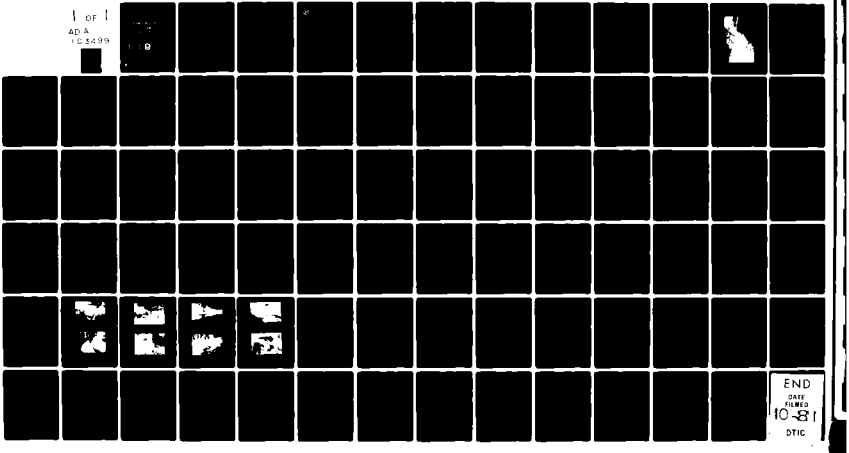

LEVEL II

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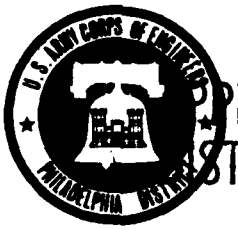
AD A103499

ATLANTIC COAST BASIN
PAGES RUN, CUMBERLAND COUNTY
NEW JERSEY

SHAWS MILL POND DAM
NJ 00075

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

JULY 1981

REPT. NO. DAEN/NAP-53842/NJ00075-81/07

National Dam Safety Program. Shaws Mill Pond Dam (NJ 00075), Atlantic Coast Basin, Pages Run, Cumberland County, New Jersey. Phase I Inspection Report.

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Visual Inspection	Spillways
Structural Analysis	Outlet works

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

31 JUL 1981

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Shaws Mill Pond Dam in Cumberland County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Shaws Mill Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 7 percent of the Spillway Design Flood (SDF) would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

b. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Monitor the observed possible seepage in order to detect any changes in its condition.

(2) Investigate the ability to drain the lake. If the need for a low level outlet is determined, a suitable outlet should be designed and installed.

c. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Eroded areas of the upstream and downstream face of dam especially in the vicinity of the spillway should be properly stabilized.

(2) Stabilization of the channel bank immediately downstream from the spillway should be renovated.

(3) Trees and adverse vegetation on the embankment should be removed.

(4) Spalled and cracked concrete on the spillway structure and apron should be repaired.

(5) Debris on the downstream side of the dam near the left end of the dam should be removed.

c. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

d. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Hughes of the Second District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-N
Honorable Brendan T. Byrne

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

SHAWS MILL POND DAM (NJ00075)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 8 January 1981 by Storch Engineers, under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Shaws Mill Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 7 percent of the Spillway Design Flood (SDF) would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

b. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Monitor the observed possible seepage in order to detect any changes in its condition.

(2) Investigate the ability to drain the lake. If the need for a low level outlet is determined, a suitable outlet should be designed and installed.

c. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Eroded areas of the upstream and downstream face of dam especially in the vicinity of the spillway should be properly stabilized.

(2) Stabilization of the channel bank immediately downstream from the spillway should be renovated.

(3) Trees and adverse vegetation on the embankment should be removed.

(4) Spalled and cracked concrete on the spillway structure and apron should be repaired.

(5) Debris on the downstream side of the dam near the left end of the dam should be removed.

c. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

d. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED: Roger Baldwin

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 31 July 81

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Shaws Mill Pond Dam, NJ00075
State Located:	New Jersey
County Located:	Cumberland
Drainage Basin:	Delaware Bay
Stream:	Pages Run
Date of Inspection:	January 8, 1981

Assessment of General Condition of Dam

Based on available records, past operational performance, visual inspection and Phase I engineering analysis, Shaws Mill Pond Dam is assessed as being in fair overall condition.

Based on investigations of the downstream flood plain made in connection with this report, it is recommended that the hazard potential classification be downgraded from high to significant hazard.

Hydraulic and hydrologic analyses indicate that the spillway is inadequate. Discharge capacity of the spillway is not sufficient to pass the designated spillway design flood (SDF) without an overtopping of the dam. (The SDF for Shaws Mill Pond Dam is equal to the 100-year storm.) The spillway is capable of passing approximately 6 percent of the SDF. Therefore, the owner should engage a professional engineer experienced in the design and construction of dams in the near future to perform more accurate hydraulic and hydrologic analyses relating to spillway capacity. Based on the findings of the analyses, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

Arrangements should be be made in the near future to monitor the observed possible seepage in order to detect any changes in its condition. The monitoring should be performed by a professional engineer experienced in the design and construction of dams.

In addition, it is recommended that the following remedial measures be undertaken in the near future:

1) Eroded areas of the upstream and downstream face of dam especially in the vicinity of the spillway, should be properly stabilized.

2) Stabilization of the channel bank immediately downstream from the spillway should be renovated.

3) Trees and adverse vegetation on the embankment should be removed.

4) Debris on the downstream side of the dam near the left end of the dam should be removed.

5) The ability to drain the lake should be investigated by an engineer experienced in the design and construction of dams. If the need for a low level outlet is determined, a suitable outlet should be designed and installed.

6) Spalled and cracked concrete on the spillway structure and apron should be repaired.

In the future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

Richard J. McDermott, P.E.

John E. Gribbin, P.E.

OVERVIEW - SHAWS MILL POND DAM

31 JANUARY 1981

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydraulic and hydrologic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydraulic and hydrologic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

SHAWS MILL POND DAM, I.D. NJ00075

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspection of Shaws Mill Pond Dam was made on January 8, 1981. The purpose of the inspection was to make a general assessment of the structural integrity and operational adequacy of the dam structure and its appurtenances.

1.2 Description of Project

a. Description of Dam and Appurtenances

The facilities at Shaws Mill Pond Dam consist of an earthfill dam with a paved roadway on its crest. A spillway consisting of a concrete drop inlet discharging through two 36-inch cast iron culverts is located at the right end. A stone masonry headwall is located at the upstream end of the culverts while a concrete headwall with concrete wingwalls and apron is located at the downstream end.

The drop inlet is fitted with timber stoplogs (1.8 feet long) in a notch in the upstream wall. The walls of the drop inlet are constructed at two levels resulting in primary and secondary stages for the spillway weir with effective lengths of 7.0 feet and 10.0 feet, respectively. The secondary stage elevation is 20.6, National Geodetic Vertical Datum (N.G.V.D.) while that of the primary stage is 19.8, about 4.5 feet below the roadway crest. The length of dam is 470 feet and the height of dam is 14.8 feet.

b. Location

Shaws Mill Pond Dam is located in the Township of Lawrence, Cumberland County, New Jersey. Principal access to the dam is by Shaws Mill Road which is entered from Newport-Center Grove Road approximately 3000 feet from its intersection with Route 553. The dam is located about 4000 feet north of Cumberland County Route 553.

Discharge from the spillway of the dam flows into Pages Run, a tributary of Nantuxent Creek.

c. Size and Hazard Classification

The dam is classified in accordance with criteria presented in "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers. Size categories consist of Small, Intermediate and Large while hazard categories are designated as Low, Significant and High.

Size Classification: Shaws Mill Pond Dam is classified as "Small" size since its maximum storage volume is 268 acre-feet (which is less than 1000 acre-feet) and its height is 14.8 feet (which is less than 40 feet).

Hazard Classification: Visual inspection of the downstream flood plain of the dam indicates that failure of the dam due to overtopping would not cause inundation of the railroad embankment located 1000 feet downstream of the dam. However, backwater resulting from the railroad embankment could cause partial inundation of two dwellings located between the dam and the railroad. Loss of life would not be anticipated to number more than a few. Damage could be sustained by the road bridge for County Route 553 located 3500 feet downstream from the dam. Accordingly, Shaws Mill Pond Dam is classified as "Significant" Hazard.

d. Ownership

Shaws Mill Pond Dam is owned by the County of Cumberland, County Complex, 800 E. Commerce Street, Bridgeton, N.J. 08302. The impoundment, Shaws Mill Pond, is owned by the New Jersey State Department of Environmental Protection, Division of Fish, Game and Wildlife.

e. Purpose of Dam

The purpose of the dam is the impoundment of a recreational lake facility.

f. Design and Construction History

Reportedly, no records or plans for the dam are on file.

g. Normal Operational Procedure

The dam and appurtenances are maintained by the Cumberland County Road Department. There is no fixed schedule of maintenance; repairs are made as the need arises.

1.3 Pertinent Data

a. Drainage Area	3.5 square miles
b. Discharge at Damsite	
Maximum flood at damsite	Unknown
Outlet works at normal pool elevation	N.A.
Spillway capacity at top of dam	144 c.f.s.
c. Elevation (N.G.V.D.)	
Top of Dam	24.3
Maximum highwater (design)	25.6
Principal spillway crest	19.8
Secondary spillway crest	20.6
Streambed at toe of dam	9.5
Maximum tailwater	13.0 (Estimated)
d. Reservoir Length	
Length of design surcharge	3000 feet (Estimated)
Length of normal pool	2600 feet (Scaled)

e. Storage (Acre-feet)

SDF maximum stage	350
Normal pool	87
Top of dam	268

f. Reservoir Surface (acres)

SDF maximum stage	73.0 (Estimated)
Normal pool	28.0 (Estimated)
Top of dam	63.0 (Estimated)

g. Dam

Type	Earthfill
Length	470 feet
Height	14.8 feet
Sideslopes - Upstream	1 horiz. to 1 vert.
- Downstream	1.5 horiz. to 1 vert.
Zoning	Unknown
Impervious core	Unknown
Grout curtain	Unknown

h. Diversion and Regulating Tunnel — N.A.

i. Spillway

Type	Concrete Drop Inlet
Length of weir - Primary	7.0 feet
- Secondary	10.0 feet
Crest elevation - Primary	19.8
- Secondary	20.6
Discharge channel	Natural Stream

j. Regulating outlet

Timber stoplogs, 1.8 feet long, in primary spillway.

SECTION 2: ENGINEERING DATA

2.1 Design

No plans or calculations pertaining to the original design of the dam could be obtained.

2.2 Construction

No data or reports pertaining to the construction of the dam are available.

2.3 Operation

No data or reports pertaining to the construction of the dam are available.

2.4 Evaluation

a. Availability

No data or reports pertaining to the construction of the dam are available.

b. Adequacy

Available engineering data pertaining to Shaws Mill Pond Dam is not adequate to be of significant assistance to the performance of a Phase I evaluation. A list of absent information is included in paragraph 7.1.b.

c. Validity

The validity of the engineering data cannot be assessed due to the absence of data.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

Shaws Mill Pond Dam was inspected on January 8, 1981 by members of the staff of Storch Engineers. A copy of the visual inspection checklist is contained in Appendix 1. The following procedures were employed for the inspection:

1) The embankment of the dam, appurtenant structures and adjacent areas were examined.
2) The embankment and accessible appurtenant structures were measured and key elevations were determined by surveyor's level.
3) The embankment, appurtenant structures and adjacent areas were photographed.
4) The downstream flood plain was toured to evaluate downstream development and restricting structures.

b. Dam

The paved roadway was in generally satisfactory condition. The upstream face of the dam was covered with grass bushes, briars and trees. The trees ranged in size from 2 inches to 12 inches. Also the alignment of the upstream face was somewhat irregular, with grooves or indentations which appeared to be due to pedestrian activity. The downstream face was covered with leaves, briars, bushes and trees. The trees ranged in size from 2 inches to about 30 inches. The downstream face alignment was also somewhat irregular. It contained gulleys due to a combination of surface runoff and pedestrian activity. There were numerous paths running along the downstream side of the dam indicating considerable pedestrian activity on the dam (See Section 3.1.f). On the downstream side of the dam near

its left end, starting approximately 75 feet to the left of the point where the downstream channel bends away from the dam, there was considerable fill which had been dumped from the roadway. The top of the fill extended approximately 5 to 10 feet beyond the downstream side of the crest of dam. The alignment of the fill was very irregular, and the downstream slope of the fill was steep. There was also considerable debris that has been dumped in conjunction with the fill.

A depression was observed in the pavement on the crest of the dam on the downstream side just to the left of the spillway culvert where a puddle had formed. The depression could indicate some consolidation or loss of soil in that area of the embankment. However, there was no significant cracking around the depression indicating that the settlement did not occur since the roadway was paved.

Orange colored deposits were observed in the bed of the downstream channel in the immediate area of the spillway. It could not be determined whether or not they were due to seepage under or through the dam.

c. Appurtenant Structures

The headwall, wingwalls and apron on the downstream side of the spillway appeared to be generally sound. However, there was some cracking and spalling present. The right wingwall was spalled at a height of about 2½ feet above the apron for a distance of about 12 feet downstream from the headwall. The spall had a maximum depth of about 2 inches. The headwall also had some minor cracks running horizontally about 6 or 8 inches below its top. There were also some other horizontal cracks running about halfway between the top of the headwall and the two 36-inch cast iron culvert pipes. Exudation was present in connection with these cracks.

The apron appeared to be somewhat eroded although it was obscured by discharge. The cast iron pipes appeared to be in satisfactory condition although their inverts are obscured by the discharge. The drop inlet structure on the upstream side was in generally stable condition. The bottom was formed by concrete, but covered over with silt. The upstream headwall appeared to be in satisfactory condition.

d. Downstream Channel

The downstream channel is a natural stream which meanders through a flat wooded terrain. The stream has wooded banks approximately 1 to 2 feet high with flat terrain beyond. The bottom of the channel is sandy. There is evidence of some erosion at some of the bend points in the banks of the stream where there are some roots exposed.

e. Reservoir Area

The reservoir area appeared to be entirely wooded around its perimeter. The bank or shore slopes appeared to be moderate, approximately 5%.

f. Erosion

Erosion was observed on the upstream face of the dam just to the left of the upstream headwall of the spillway. It appeared to be due to surface runoff and possibly pedestrian activity. There was also considerable erosion on the left side of the downstream wingwall in two areas. One area consisted of a deep gully approximately 2 feet deep and 18 inches wide with roots exposed. It appeared to be due to surface runoff and pedestrian activity. The upstream end of this erosion had been stabilized by some concrete curbing although some sections of the curbing were leaning in a downstream direction. The whole area should be filled and properly stabilized. It appeared

that erosion was present on the right side of the downstream wingwall, although the area was obscured by bushes and briars. At the downstream end of the right wingwall a timber wall was noted. It appeared to be stabilizing the bank of the downstream channel in that area. The timber wall extended approximately 20 feet downstream and was in deteriorated condition.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in Shaws Mill Pond is regulated by discharge over the concrete spillway located at the right end of the dam. The dam does not appear to contain a low level outlet to facilitate lake drawdown or to augment spillway flow.

4.2 Maintenance of the Dam

Reportedly, maintenance is performed on an "as needed" basis.

4.3 Maintenance of Operating Facilities

Reportedly, there is no program of regular maintenance of the operating facilities.

4.4 Description of Warning System

Reportedly, no formal warning system is in use at the present time.

4.5 Evaluation of Operational Adequacy

The operation of the dam has been adequate to the extent that the dam reportedly has not been overtopped.

Maintenance documentation is poor and maintenance has been inadequate in the following areas:

1) Trees and brush on the embankment not removed.
2) Debris on downstream side of embankment not removed.
3) Erosion on downstream and upstream side of embankment not repaired.
4) Spalled and cracked concrete on the spillway structure not repaired.
5) Deteriorated timber wall stabilization of downstream channel not renovated.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

The quantity of storm water runoff that the spillway should be able to handle is based on the size and hazard classification of the dam. This runoff quantity, called the spillway design flood (SDF) is described in terms of return frequency or Probable Maximum Flood (PMF) depending on the extent of the dam's size and potential hazard. According to the "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers, the SDF for Shaws Mill Pond Dam falls in a range of 100-year storm to 1/2 PMF. In this case, the low end of the range, 100-year storm, is chosen since the factors used to select size and hazard classification are on the low side of their respective ranges.

The SDF inflow hydrograph for Shaws Mill Pond Dam (See Appendix 4) was calculated by the Soil Conservation Service Triangular Unit hydrograph method with the curvilinear transformation utilizing the HEC-1-DAM computer program.

General hydrologic characteristics used in this method were computed using USGS quadrangles. The drainage area contributing to the impoundment is 3.5 square miles. Most of the watershed is wooded. The SDF peak inflow was computed to be 2236 c.f.s.

The spillway discharge rates were computed by the use of a weir formula appropriate for the configuration of the spillway together with culvert capacity charts assuming inlet control. The total spillway discharge with lake level equal to the top of the dam was computed to be 144 c.f.s. The SDF was routed through the dam by use of the HEC-1-DAM computer program using the modified Puls Method. In routing the SDF, it was found

that the dam crest would be overtopped by a depth of 1.3 feet. Accordingly, the subject spillway is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Experience data for the dam could not be obtained.

c. Visual Observation

No evidence was found at the time of inspection that would indicate that the dam had been overtopped.

d. Overtopping Potential

As indicated in paragraph 5.1.a. a storm of magnitude equal to the SDF would cause overtopping of the dam by a depth of 1.3 feet over the crest of the dam. The spillway is capable of passing approximately 6 percent of the SDF with the lake level equal to the crest of dam.

e. Drawdown Data

Drawdown of the lake i accomplished by removing the stoplogs located in the primary spillway. Total estimated time of drawdown is calculated t be 2.5 days (See Appendix 4).

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observation

The dam appeared, at the time of inspection to be outwardly structurally sound with no evidence of embankment cracks or distress. Evidence of possible seepage and a depression observed in the crest of embankment did not appear to be an indication of immediate distress in the embankment.

b. Generalized Soils Description

The generalized soils description of the dam site consists of recent alluvial deposits characterized by a poorly drained swampy condition overlying an irregular mantle of stratified material referred to on the Geologic Map of New Jersey as the Cape May Formation.

c. Design and Construction Data

The analysis of structural stability and construction data for the embankment are not available.

d. Operating Records

Operating records for the dam and appurtenances are not available.

e. Post-Construction Changes

Reportedly, it is not known whether or not there have been any post-construction changes. No evidence of significant post-construction changes was noted at the time of inspection.

f. Seismic Stability

Shaws Mill Pond Dam is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams," which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions, if stable under static loading conditions. The dam appeared to be stable under static loading conditions at the time of inspection.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment

a. Safety

Based on the hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4, the spillway of Shaws Mill Pond Dam is assessed as being inadequate. The spillway is not able to pass the SDF without an overtopping of the dam.

The embankment appeared at the time of inspection, to be generally outwardly stable.

b. Adequacy of Information

Information sources for this study included: 1) field investigations, 2) USGS quadrangles and 3) consultation with Cumberland County Engineering Department. The information obtained is adequate for a Phase I Assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some of the absent data are as follows:

1. Construction and as-built drawings.
2. Description of fill material for embankment.
3. Design computations and reports.
4. Soils report for the site.
5. Maintenance documentation.
6. Post-construction engineering reports.

c. Necessity for Additional Data/Evaluation

The data available and the evaluations performed are considered to be sufficient to permit a Phase I assessment of Shaws Mill Pond Dam.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a, the spillway is considered to be inadequate. It is therefore recommended that a professional engineer experienced in the design and construction of dams be engaged in the near future to perform more accurate hydraulic and hydrologic analyses relating to spillway capacity. Based on the findings of these analyses, the need for and type of remedial measures should be determined and then implemented.

The owner should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dam.

In addition, it is recommended that the following remedial measures be undertaken in the near future:

1) Eroded areas of the upstream and downstream face of dam, especially in the vicinity of the spillway, should be properly stabilized.

2) Stabilization of the channel bank immediately downstream from the spillway should be renovated.

3) Trees and adverse vegetation on the embankment should be removed.

4) Debris on the downstream side of the dam near the left end of the dam should be removed.

5) The ability to drain the lake should be investigated by an engineer experienced in the design and construction of dams. If the need for a low level outlet is determined, a suitable outlet should be designed and installed.

6) Spalled and cracked concrete on the spillway structure and apron should be repaired.

b. Maintenance

In the future, the owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

c. Additional Studies

Arrangements should be made in the near future to monitor the observed possible seepage in order to detect any changes in its condition. The monitoring should be performed by a professional engineer experienced in the design and construction of dams.

PLATES

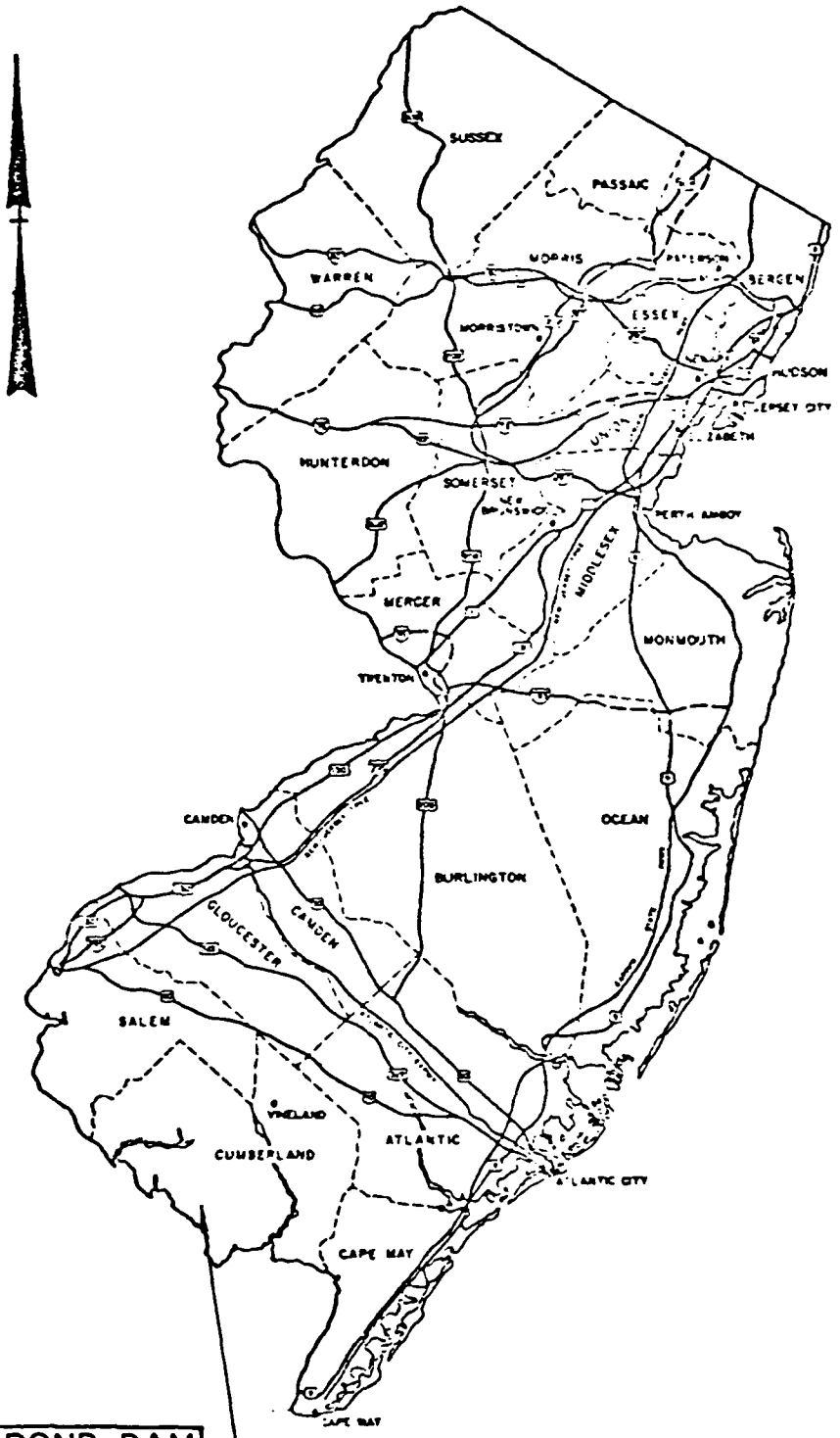


PLATE 1

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS KEY MAP SHAWS MILL POND DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	SCALE: NONE DATE: FEB. 1981

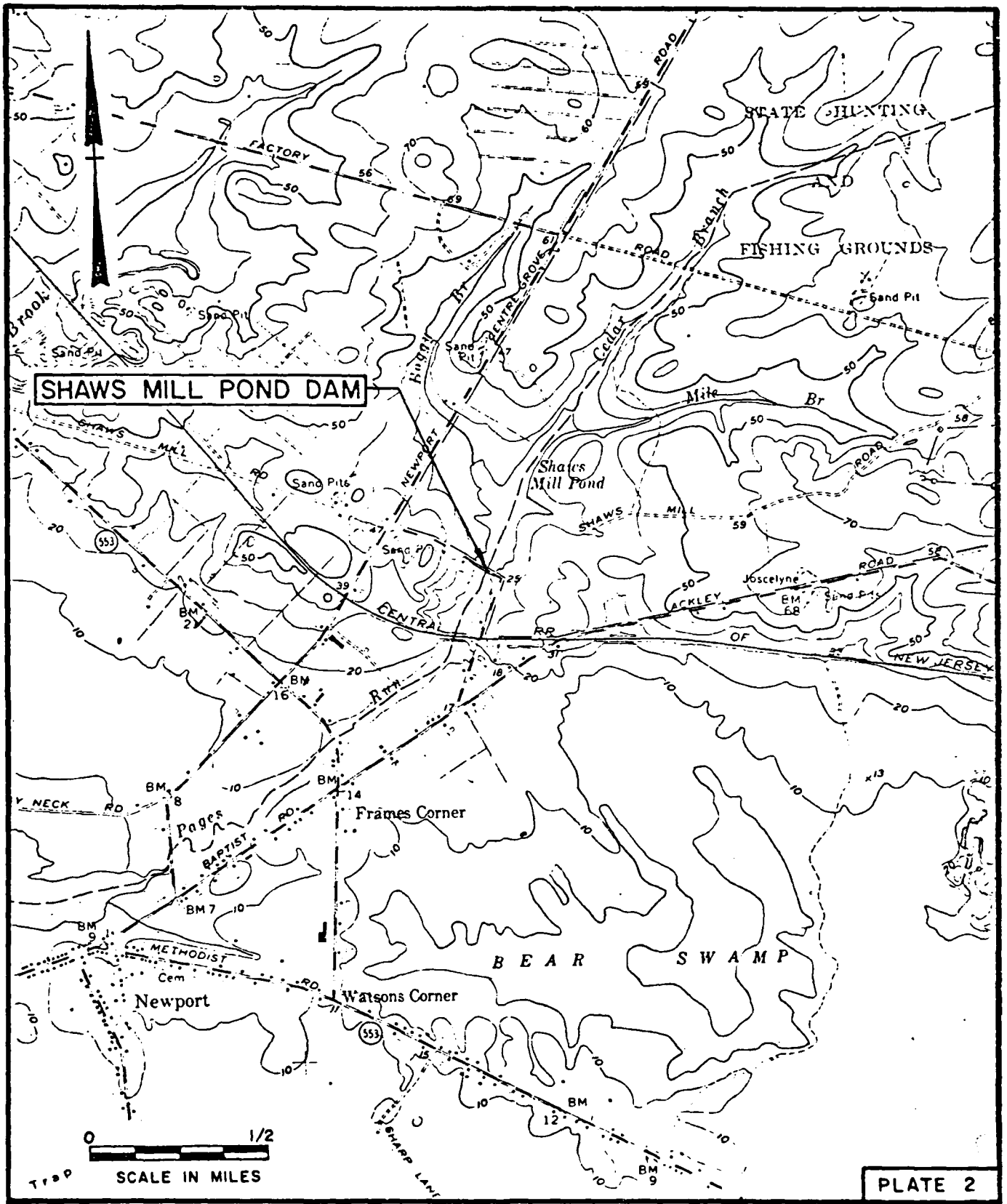


PLATE 2

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

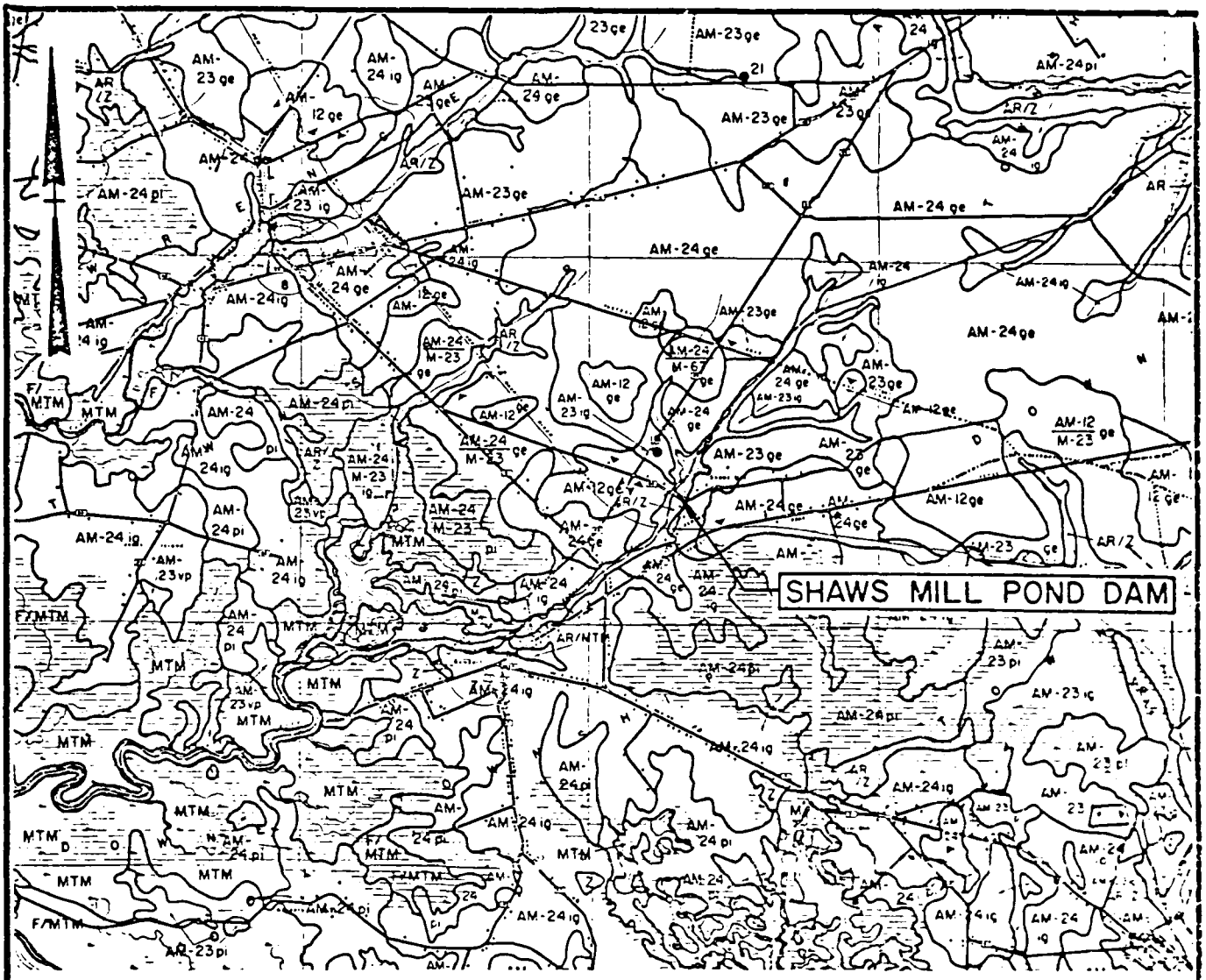
INSPECTION AND EVALUATION OF DAMS

VICINITY MAP

SHAWS MILL POND DAM

SCALE: AS SHOWN

DATE: FEB. 1981



Legend

AM-12 Unconsolidated, stratified alluvial material shown on the Geologic Map of New Jersey as the Cape May Formation.

AM-23 Irregular mantle of stratified material referred to on the Geologic Map of New Jersey as the Cape May Formation.

AM-24 Unconsolidated, stratified alluvial material deposited during the Quatemary Period, referred to on the Geologic Map of New Jersey as the Cape May Formation.

Note: Information taken from Rutgers University, Soil Survey of New Jersey, Report No. 21, Cumberland County, June 1955 and Geologic Map of New Jersey prepared by J.V. Lewis and H. Kummel 1910-1912, revised by H. B. Kummel 1931 and M. Johnson 1950.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY.

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

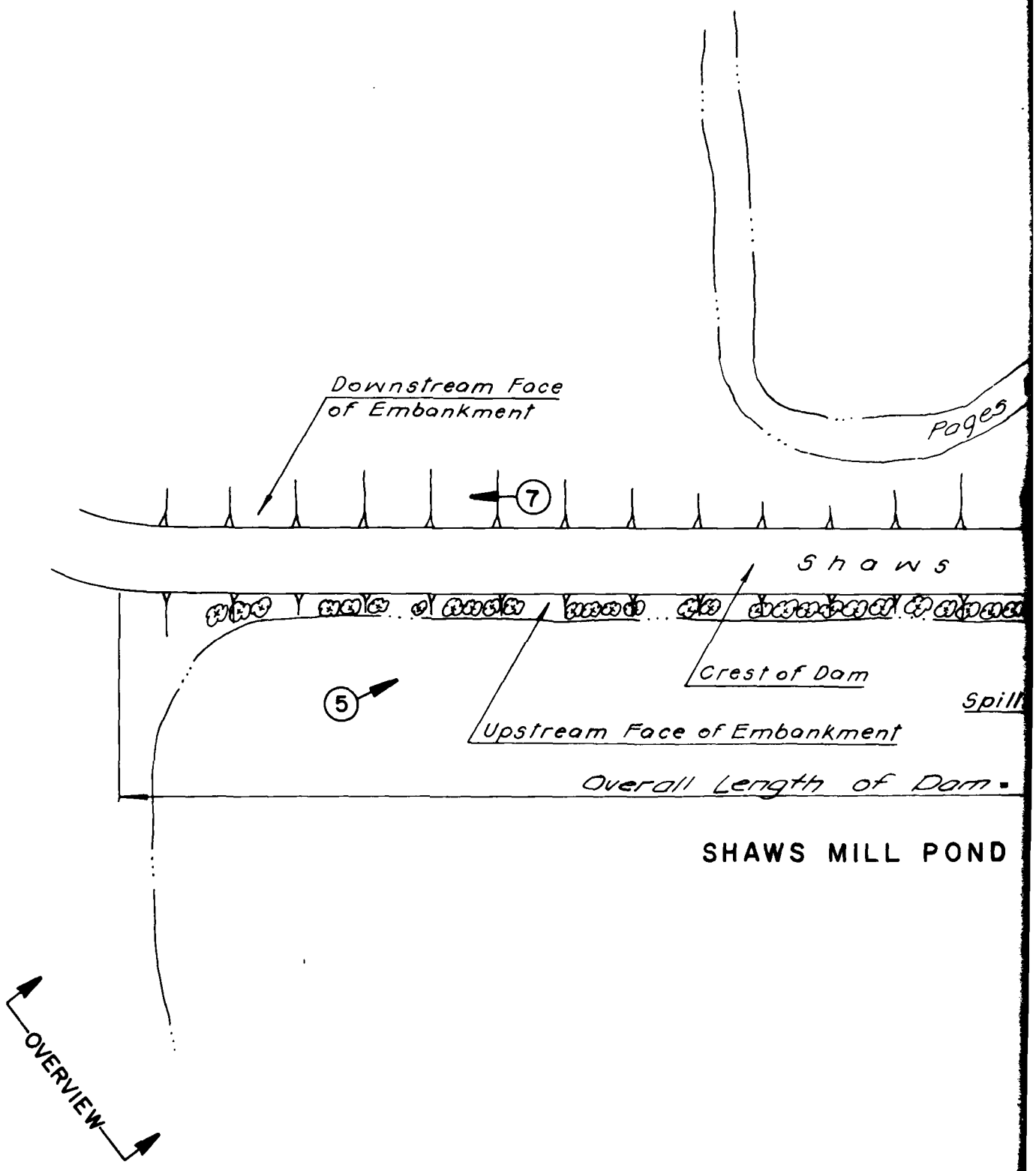
INSPECTION AND EVALUATION OF DAMS

SOIL MAP

SHAWS MILL POND DAM

SCALE: NONE

DATE: FEB. 1981



Note:
Information taken from field
inspection January 8, 1981

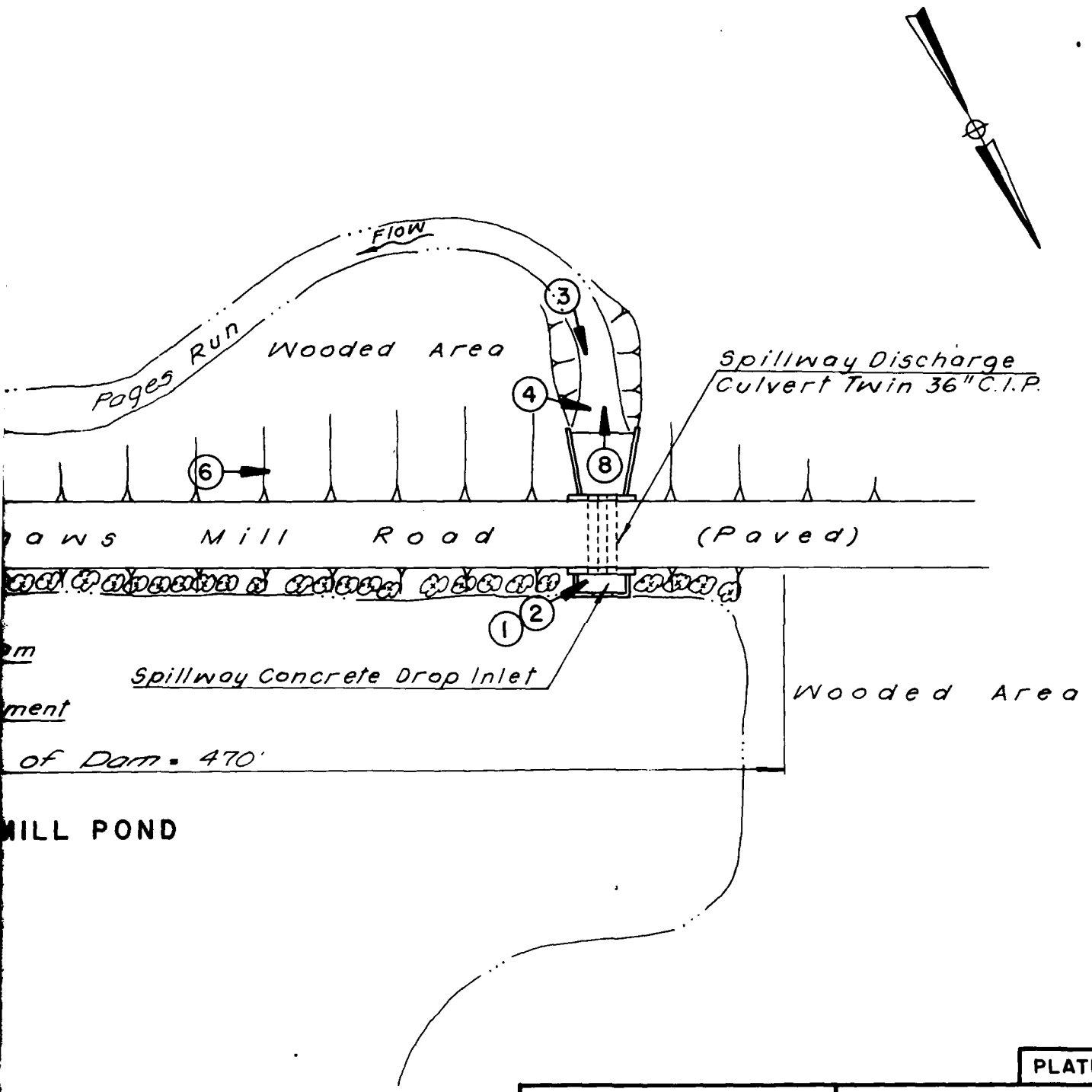


PLATE 4

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

PHOTO LOCATION PLAN
SHAWS MILL POND DAM

I.D.N.J.00075	SCALE: NOT TO SCALE
	DATE: FEB. 1981

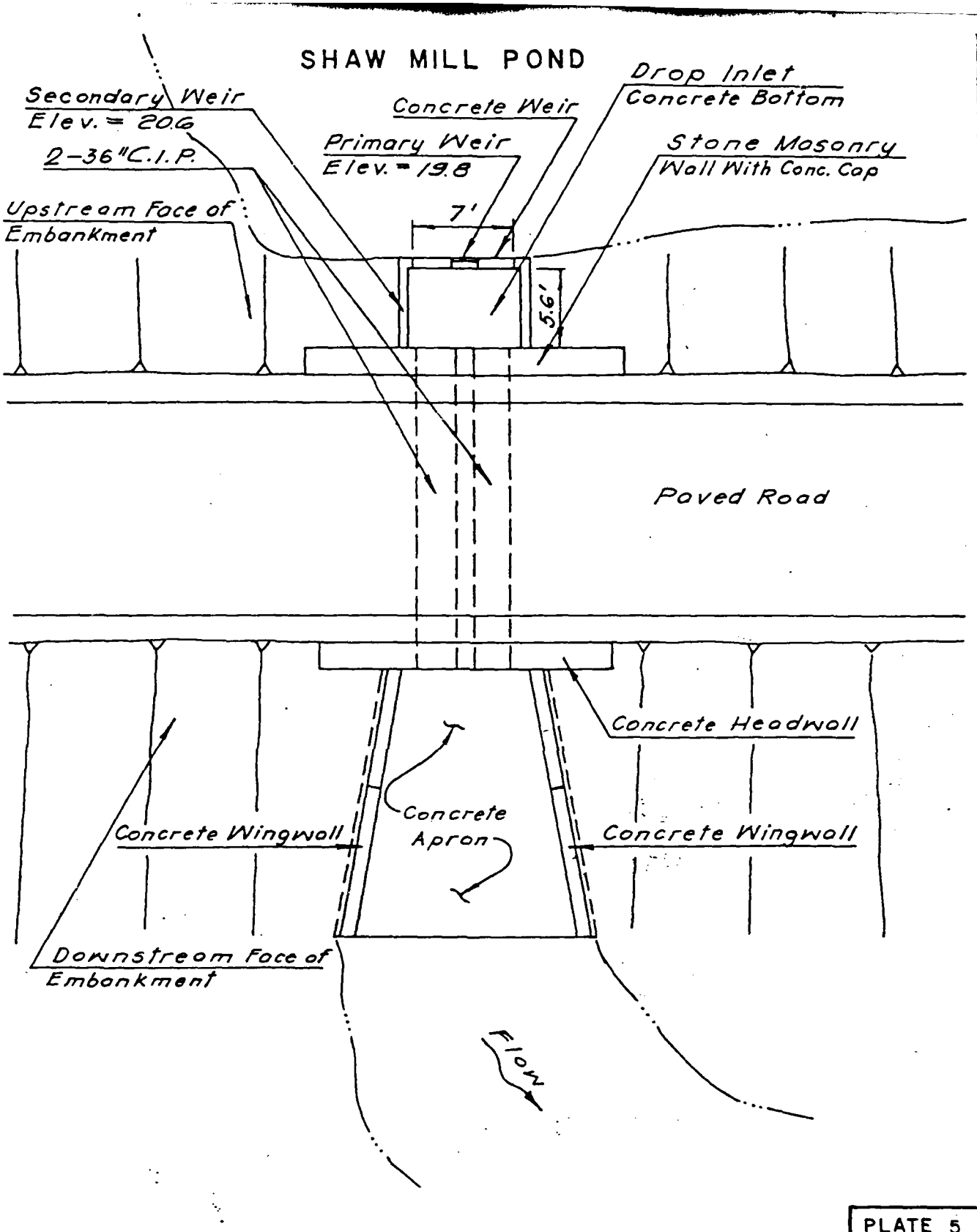
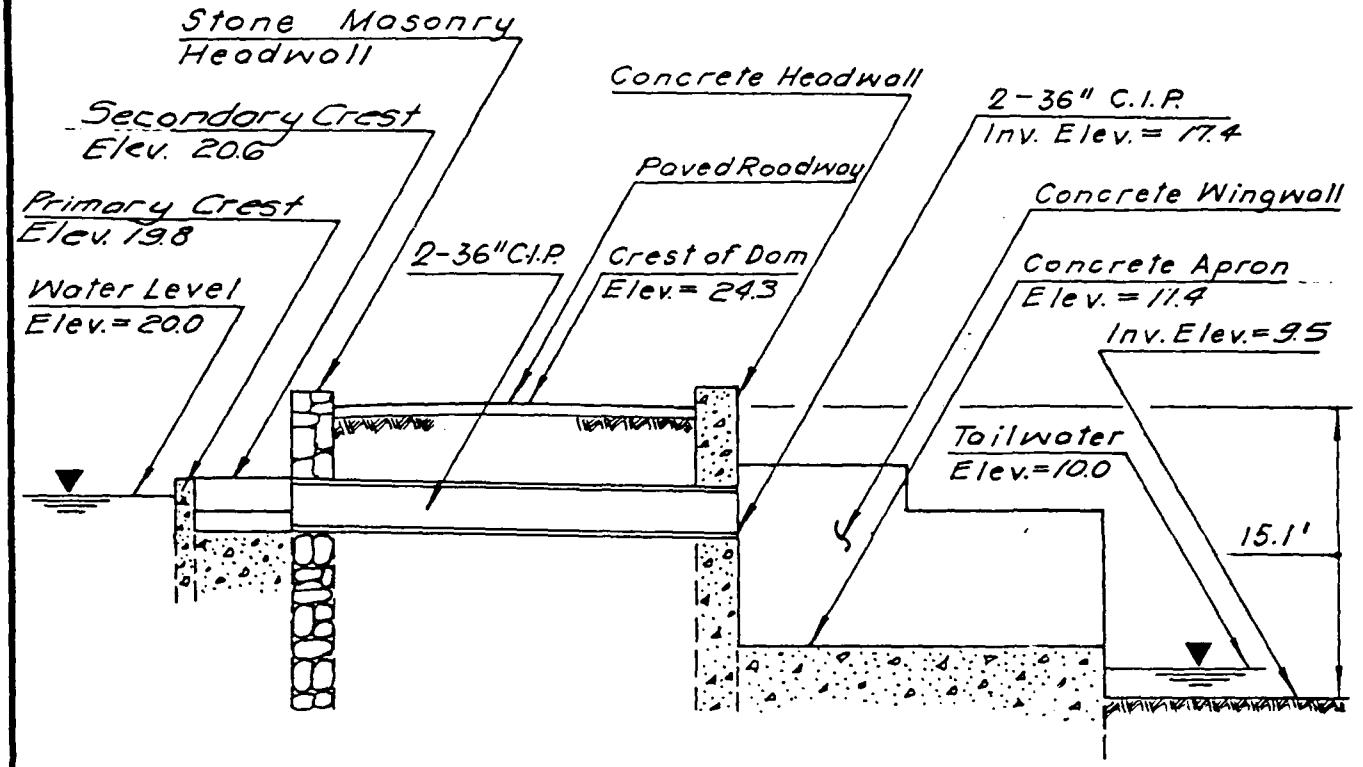
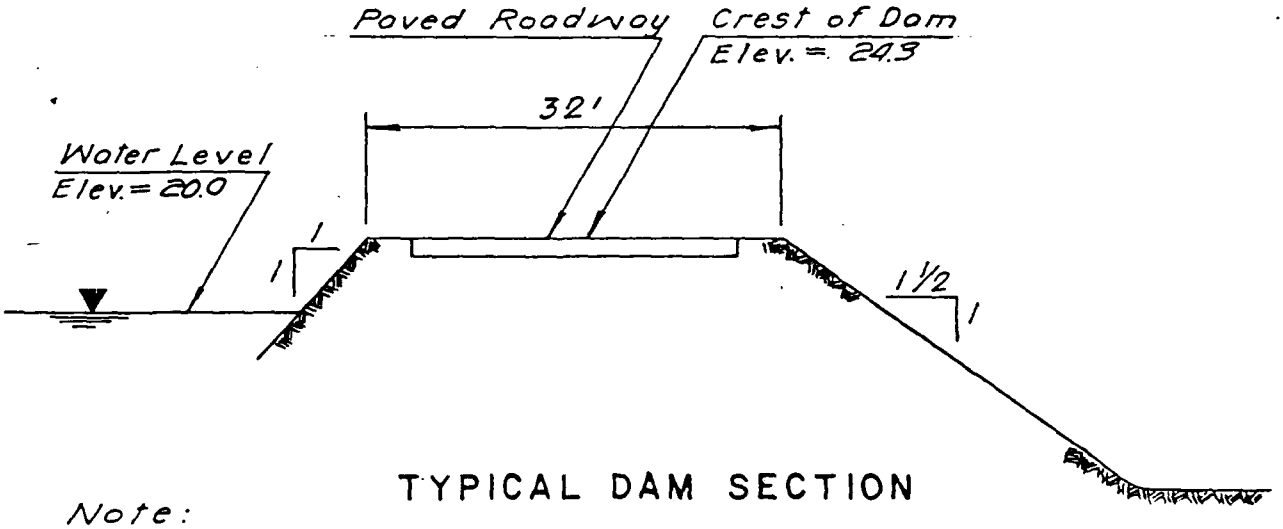


PLATE 5

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS SPILLWAY PLAN SHAW MILL POND DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY.	I.D.N.J. 00075 | SCALE: NONE DATE: FEB. 1981



SPILLWAY SECTION

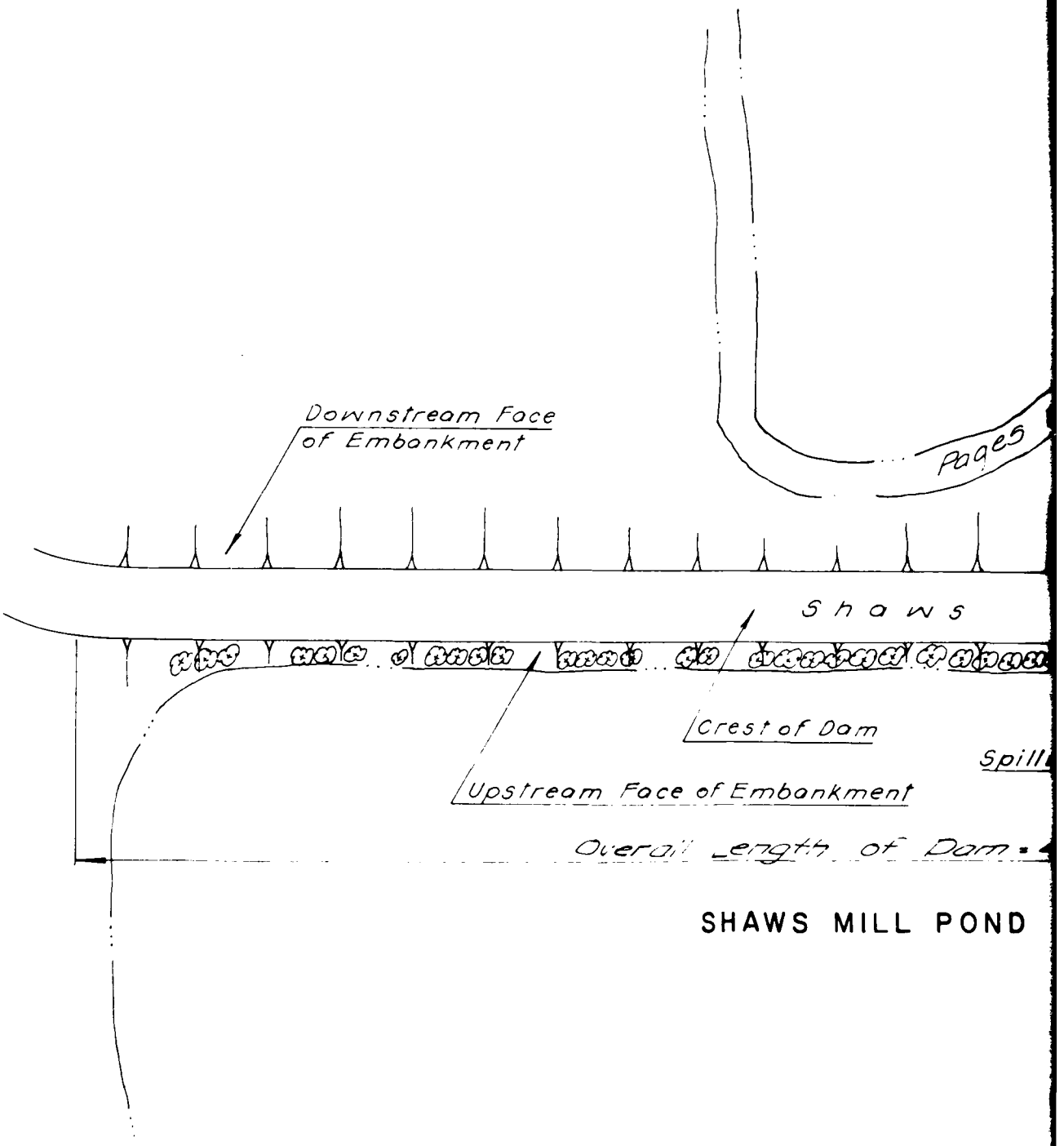


TYPICAL DAM SECTION

Note:
Information taken from field inspection January 8, 1981

PLATE 6

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS SECTIONS SHAW MILL POND DAM
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	I.D. N.J. 00075 / SCALE: NONE DATE: FEB. 1981



SHAWS MILL POND

Note:
Information taken from field
inspection January 8, 1981

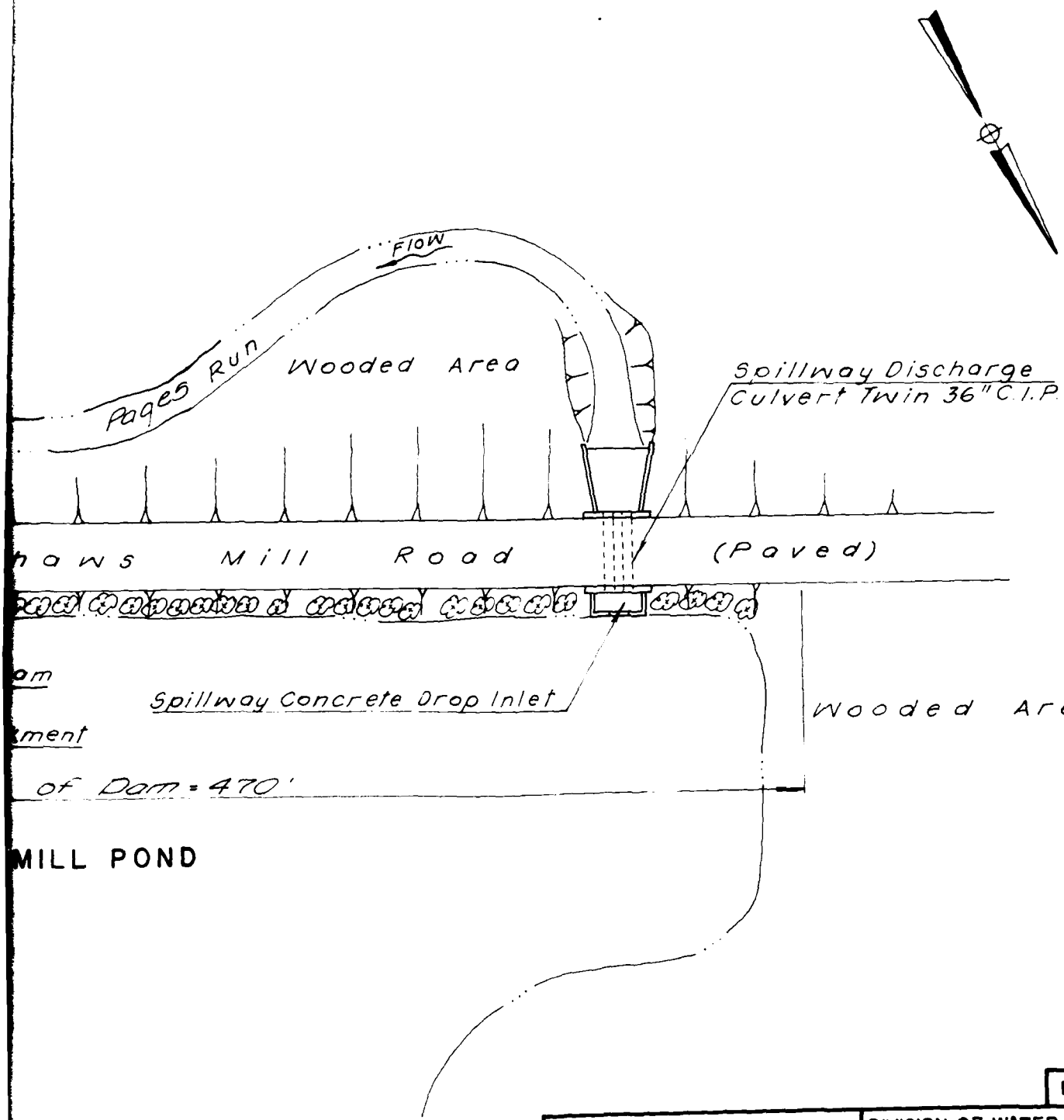


PLATE 7

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

GENERAL PLAN
SHAWS MILL POND DAM

I.D. N.J. 00075	SCALE: NOT TO SCALE
	DATE: FEB 1981

APPENDIX 1

Check List - Visual Inspection

Check List - Engineering Data

Check List

Visual Inspection

Phase I

Name of Dam Shaws Mill Pond Dam County Cumberland State N.J. Coordinators NJDEP

Date(s) Inspection 1/8/81 Weather Sunny Temperature 10° F.

Pool Elevation at time of Inspection 20.0 M.S.L. Tailwater at Time of Inspection 10.0 M.S.L.

Inspection Personnel:

John Gribbin John Powanda

Daniel Buckelew Richard McDermott

Mark Brady

John Gribbin Recorder

Owner's representative not present

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	Paved roadway on crest in generally satisfactory condition. Sideslopes covered with bushes, briars and trees (2" to 30"). Dumped fill and debris noted on downstream side near left end.	Trees should be removed. Debris should be removed.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appeared sound.	
ANY NOTICEABLE SEEPAGE	Orange colored deposits were noted in the channel bed immediately downstream from spillway.	Possible seepage should be monitored.
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

EMBANKMENT

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion was noted at various locations along the upstream and downstream faces. Also, erosion was observed adjacent to the spillway headwall and downstream wingwalls. Adjacent to the left wingwall an erosion channel 2' deep by 1.5' wide was observed. Concrete stabilization of the erosion appeared to be failing.	Erosion should be filled and stabilized.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical: generally level Horizontal: generally straight (Upstream and downstream faces somewhat irregular.)	
RIPRAP	None observed.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	Outlet works discharge through primary spillway.	Outlet works composed of timber stop-logs in spillway structure.
INTAKE STRUCTURE	N.A.	
OUTLET STRUCTURE	N.A.	
OUTLET CHANNEL	Same as spillway.	
GATE AND GATE HOUSING	Gate consists of timber stoplogs. Stoplogs appeared to be in satisfactory condition at the time of inspection although they were obscured by overflow.	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
WEIR	Weir formed by concrete drop inlet in generally stable condition. Notch in center appeared crudely cut.	
DISCHARGE CULVERTS	Cast iron pipes appeared to be in satisfactory condition although their inverts were obscured by discharge.	
WINGWALLS	Downstream concrete wingwalls and upstream stone masonry headwall appeared to be generally sound with some cracks and spalls noted. Right wingwall spalled 2" deep about 2.5' above apron. Downstream headwall spalled below culverts about 2" deep, and cracked with some exudation noted.	Spalled and cracked concrete should be repaired.
APRON	Concrete apron was obscured by discharge but appeared somewhat eroded.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed.	
OBSERVATION WELLS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OTHER		

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Shore slopes wooded with moderate grade (approx. 5%).	
SEDIMENTATION	Unknown	
STRUCTURES ALONG BANKS	None observed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTION, DEBRIS, ETC.)	Natural stream with sandy bottom and wooded along banks. Channel flows from spillway along toe of dam for approx. 200' then turns and flows away from dam. Timber wall stabilizing right bank immediately downstream from spillway was in deteriorated condition.	Bank stabilization should be renovated.
SLOPES	Stream banks about 1' to 2' high with flat flood plain beyond banks.	
STRUCTURES ALONG BANKS	Two dwellings located within 800' of dam. Railroad embankment with restrictive culvert located 1000' downstream. Dwelling and road bridge located about 3500' downstream from dam.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM			REMARKS
DAM	-	PLAN	Not Available
		SECTIONS	
SPILLWAY	-	PLAN	Not Available
		SECTIONS	
		DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS			Not Available
OUTLETS	-	PLAN	Not Available
		DETAILS	
		CONSTRAINTS	
		DISCHARGE RATINGS	
HYDRAULIC/HYDROLOGIC DATA			Not Available
RAINFALL/RESERVOIR RECORDS			Not Available
CONSTRUCTION HISTORY			Not Available
LOCATION MAP			Available in files of NJDEP, Div. of Water Resources, P.O. Box CN-029, Trenton, New Jersey.

ITEM	REMARKS
DESIGN REPORTS	Not Available
GEOLOGY REPORTS	Not Available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM INSTABILITY SEEPAGE STUDIES	Not Available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not Available
POST-CONSTRUCTION SURVEYS OF DAM	Not Available
BORROW SOURCES	Not Available

ITEM	REMARKS
MONITORING SYSTEMS	Not Available
MODIFICATIONS	Not Available
HIGH POOL RECORDS	Not Available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not Available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Not Available
MAINTENANCE OPERATION RECORDS	Reference to drawdown of lake in 1971 in NJDEP file. It could not be determined how the drawdown was accomplished.

APPENDIX 2

Photographs

PHOTO 1
SPILLWAY - DROP INLET

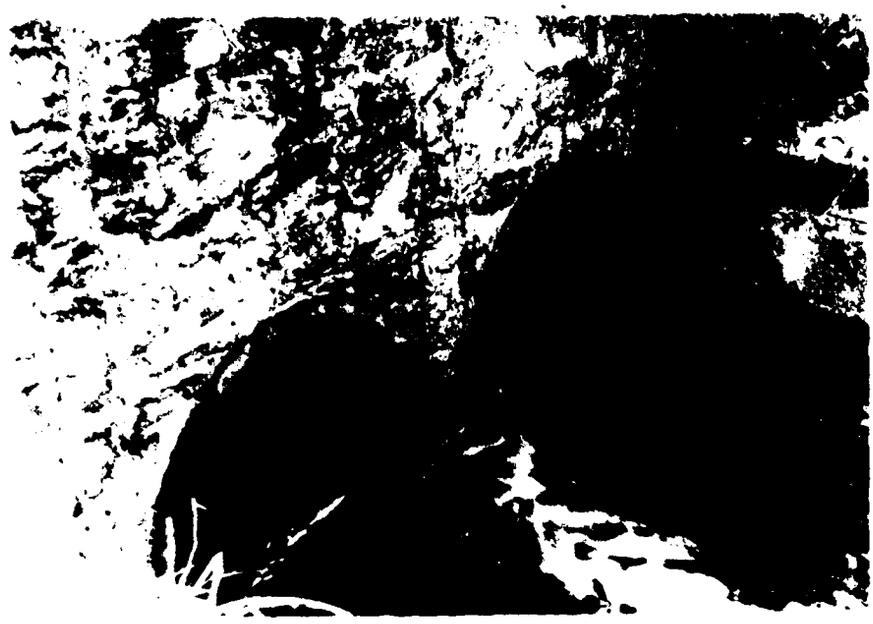


PHOTO 2
UPSTREAM END OF SPILLWAY DISCHARGE CULVERTS

SHAWS MILL POND DAM
8 JANUARY 1981

PHOTO 3
DOWNSTREAM END OF SPILLWAY DISCHARGE CULVERTS

PHOTO 4
LOW TIMBER WALL STABILIZING CHANNEL BANK AT DOWNSTREAM END
OF CULVERT WINGWALL

SHAWS MILL POND DAM
8 JANUARY 1981

PHOTO 5
UPSTREAM FACE OF DAM

PHOTO 6
DOWNSTREAM FACE OF DAM

SHAWS MILL POND DAM
8 JANUARY 1981

PHOTO 7
DEBRIS ON DOWNSTREAM FACE OF DAM

PHOTO 8
DOWNSTREAM CHANNEL

SHAWS MILL POND DAM
8 JANUARY 1981

APPENDIX 3

Engineering Data

CHECK LIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 20.0 (87 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 25.6

ELEVATION TOP DAM: 24.3

SPILLWAY CREST:

a. Elevation 19.8 (Primary), 20.6 (Secondary)

b. Type Concrete Drop Inlet

c. Width 1.3 feet

d. Length 7 feet (Primary), 10 feet (Secondary)

e. Location Spillover Upstream side of dam

f. Number and Type of Gates One set of timber stoplogs

OUTLET WORKS: None

a. Type N.A.

b. Location N.A.

c. Entrance Invert N.A.

d. Exit Invert N.A.

e. Emergency Draindown Facilities: Remove stoplogs (Lake can be lowered 2 feet)

HYDOMETEOROLOGICAL GAGES: None

a. Type N.A.

b. Location N.A.

c. Records N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake Stage Equal to Top of Dam) 144 c.f.s.

APPENDIX 4

Hydraulic/Hydrologic Computations

HYDROLOGY

HYDROLOGIC ANALYSIS

THE RUNOFF HYDROGRAPH WILL BE DEVELOPED BY THE HEC-1-DAM COMPUTER PROGRAM USING THE SCS METHOD WITH THE CURVILINEAR TRANSFORMATION.

DRAINAGE AREA = 3.5 SQ MI

INFILTRATION DATA

INITIAL INFILTRATION - 1.5 IN

CONSTANT INFILTRATION - 0.15 IN/HOUR

TIME OF CONCENTRATION

1. [by: SCS - TR 55:]

OVERLAND FLOW:

LENGTH	=	3,500	[FL]
AVE. SLOPE	=	0.7	[%]
$\Delta H = 82.0' - 58.0' = 24'$			
AVE. VELOCITY	=	0.21	[F.p.s.]

CHANNEL FLOW:

LENGTH	=	6,500	[FL]
AVE. SLOPE	=	0.554	[%]
$\Delta H = 58.0' - 22.0' = 36'$			
AVE. VELOCITY	=	1.27	[F.p.s.]

$$T_c = \left[\left(\frac{3500}{.21}\right) + \left(\frac{6500}{1.27}\right)\right] \frac{1}{3600} = 4.6 + 1.4$$

$T_c = 6.0$ Hr.

2. [Handbook of applied hydrology' by Chow, Pg 14-36]

$$T_c = \frac{2.14\sqrt{2/3\, L\, \eta}}{\sqrt{S}}$$

$$T_c = \frac{2.14\sqrt{\frac{2}{3}(3500 \times .4)}}{\sqrt{.007}}$$

$T_c = 77.5$ min

T_c = time of concentration [min]
S = slope [%]
η = .4 roughness coefficient
L = length of overland flow [FL]

$T_c = 1.3 + 1.4 = 2.7$ Hr

3. [by 'Design of small dams', Pg 71]

$$T_c = \left(\frac{11.9\,(L)^3}{H}\right)^{.385}$$

$$T_c = \left(\frac{11.9\,(1.89)^3}{60}\right)^{.385}$$

T_c = time of concentration [Hr]
L = longest water course [Mi]
H = elev. difference

$L = 1.89$ [Mi]
$H = 60$ [FL]

$T_c = 1.1$ Hr.

COMPUTER INPUT

$T_c = 4.2$ Hr. LAG = 60%

LAG Time = 2.5 Hr.

STORCH ENGINEERS

Sheet 4 of 12

Project 1132-06 SHAWS MILL POND DAM Made By JiHa Date 3-26-81

Chkd By JG Date 4/10/81

PRECIPITATION

24 HOURS, 100-YEAR RAINSTORM

DISTRIBUTION FOR SHAWS MILL POND DAM

TIME [Hr]	RAIN [IN]
1	.08
2	.08
3	.08
4	.08
5	.08
6	.08
7	.09
8	.09
9	.18
10	.18
11	.18
12	.19
13	.30
14	.30
15	.80
16	3.00
17	.40
18	.30
19	.19
20	.18
21	.09
22	.09
23	.08
24	.08
24 [Hr]	Σ 7.2 [IN]

FROM U.S. WEATHER BUREAU Tp. 40

LAKE STORAGE VOLUME

W.L. ELEV. [Ft]	AREA [Acres]
11.0	0
20.0	29
30.0	107
40.0	310

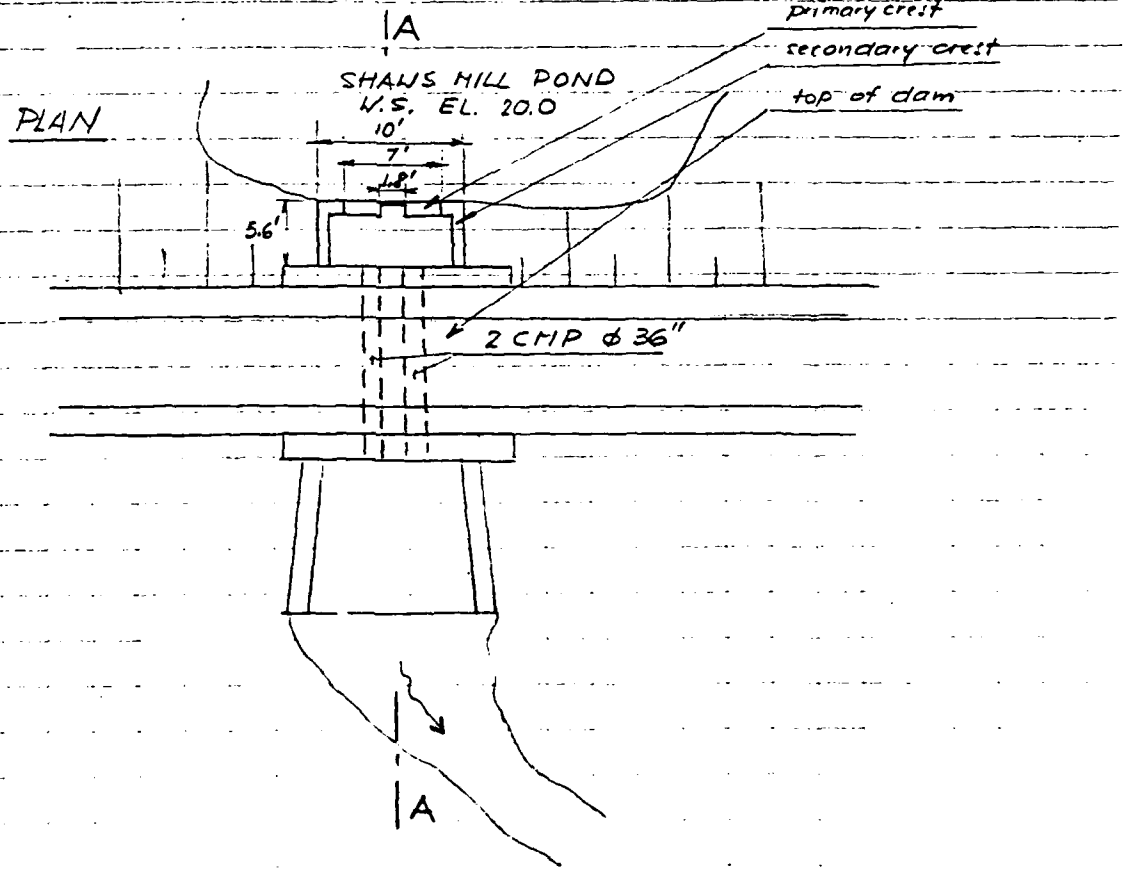
HEC-1-DAM COMPUTER PROGRAM WILL DEVELOP STORAGE CAPACITY FROM WATER SURFACE AREAS & ELEVATIONS.

INFORMATION TAKEN FROM U.S.G.S. QUADRANGLE Cedarville & Dividing Creek, N.J.

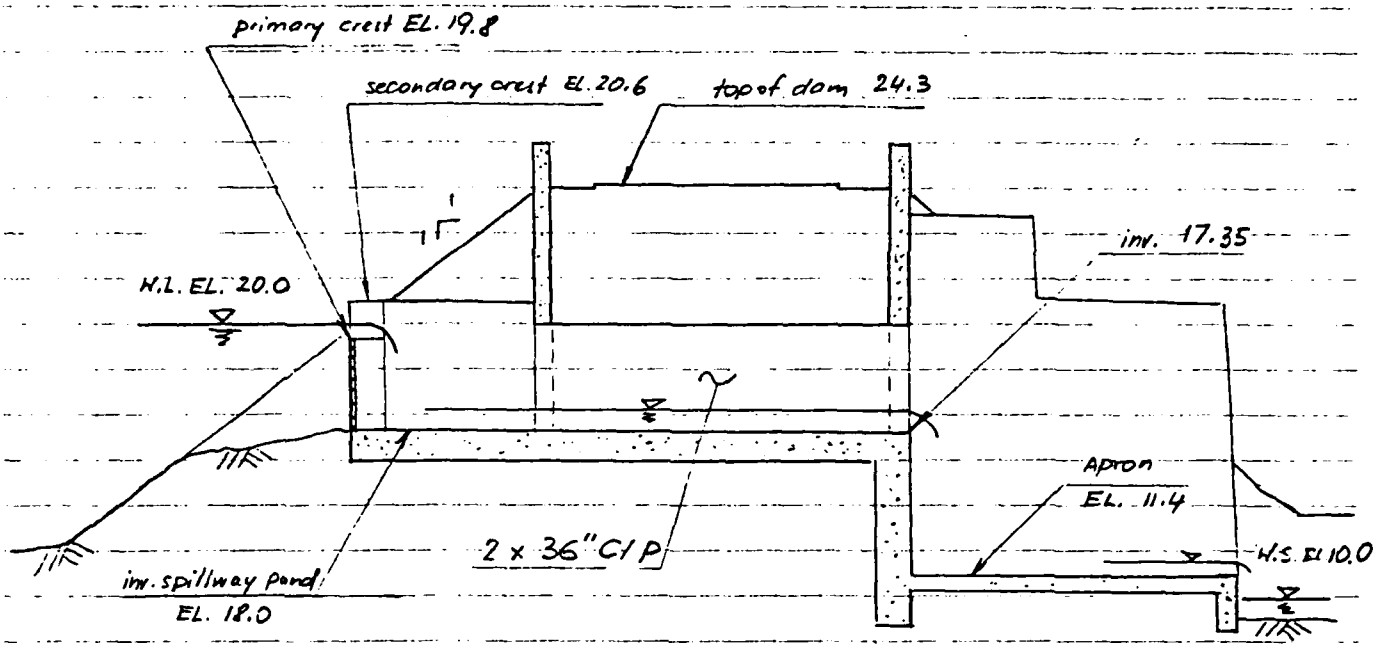
HYDRAULICS

SPILLWAY SECTION

THE SPILLWAY AT SHAWS MILL POND DAM CONSISTS OF A DROP INLET WITH THREE (3) SIDES FORMING A WEIR. THE FREE OVERFLOW WEIR HAS A PRIMARY CREST AT ELEV. 19.8 FEET AND A SECONDARY CREST AT ELEV. 20.6 FEET



ELEVATION SECTION A-A



DISCHARGE CALCULATION

[1] Handbook of hydraulics, Pg 5-23

THE DISCHARGE OF PRIMARY CREST AT ELEV. 19.8 FEET AND OF SECONDARY CREST AT ELEV. 20.6 FEET WILL BE CALCULATED USING FORMULA FOR A BROAD CRESTED WEIR

$$Q = C L H^{3/2}$$

Q = discharge [cfs]
C = coefficient of discharge
L = eff. length of spillway [Ft]
H = total head on spillway [Ft]

[Handbook of hydraulics, Pg 5-9]

THE DISCHARGE OVER THE STOPLOG FITTED IN THE PRIMARY CREST AT ELEV. 19.8 FEET WILL BE CALCULATED USING FORMULA

$Q = C L H^{3/2}$

Q = discharge [cfs]
C = coefficient of discharge
L = eff. length of spillway [Ft]
H = total head on spillway [Ft]

[SHC - Highway Culverts, Pg 5-25]

THE DISCHARGE CAPACITY FOR THE THIN 36" CIP WILL BE BASED ON HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS, ASSUMING INLET CONTROL.

SPILLWAY DISCHARGE SHALL BE TAKEN AS WEIR FLOW OR CULVERT FLOW, WHICHEVER CONTROLS.

STORCH ENGINEERS

Sheet 9 of 12

Project 1132-06 SHAWS MILL POND DAM Made By JiHa Date 3-26-81

Chkd By JG Date 4/10/81

STAGE DISCHARGE TABULATION

W.S. ELEV.	SPILLWAY - DROP INLET										TWIN 36" CMP D = 3' EL = 18.0		Total
	primary crest EL.: 19.8						Secondary cr. EL. 20.6						
	sharp weir W = .2' L = 1.8'			broad weir W = 1.3' L = 5.2			broad weir W = 1.3'						
	H	C	Q	H	C	Q	H	C	Q	Σ Q_1	HW	Q_2	Q_T
[Ft]	[Ft]		[cfs]	[Ft]		[cfs]	[Ft]		[cfs]	[cfs]	[Ft]	[cfs]	[cfs]
19.8	—	—	—	—	—	—				—	—	—	—
20.0	.2	3.33	.5	.2	2.65	1.5				2	2.0	32	2
20.6	.8	3.33	4	.8	2.75	10	—	—	—	14	2.6	58	14
21.0	1.2	3.33	8	1.2	2.95	20	.4	2.67	2	30	3.0	72	30
22.0	2.2	3.33	20	2.2	3.14	53	1.4	3.03	32	111	4.0	102	102
23.0	3.2	3.33	34	3.2	3.32	99	2.4	3.29	137	270	5.0	122	122
24.3											6.3	152	144
26.0											8.0	172	172
27.0											9.0	182	182

STORCH ENGINEERS

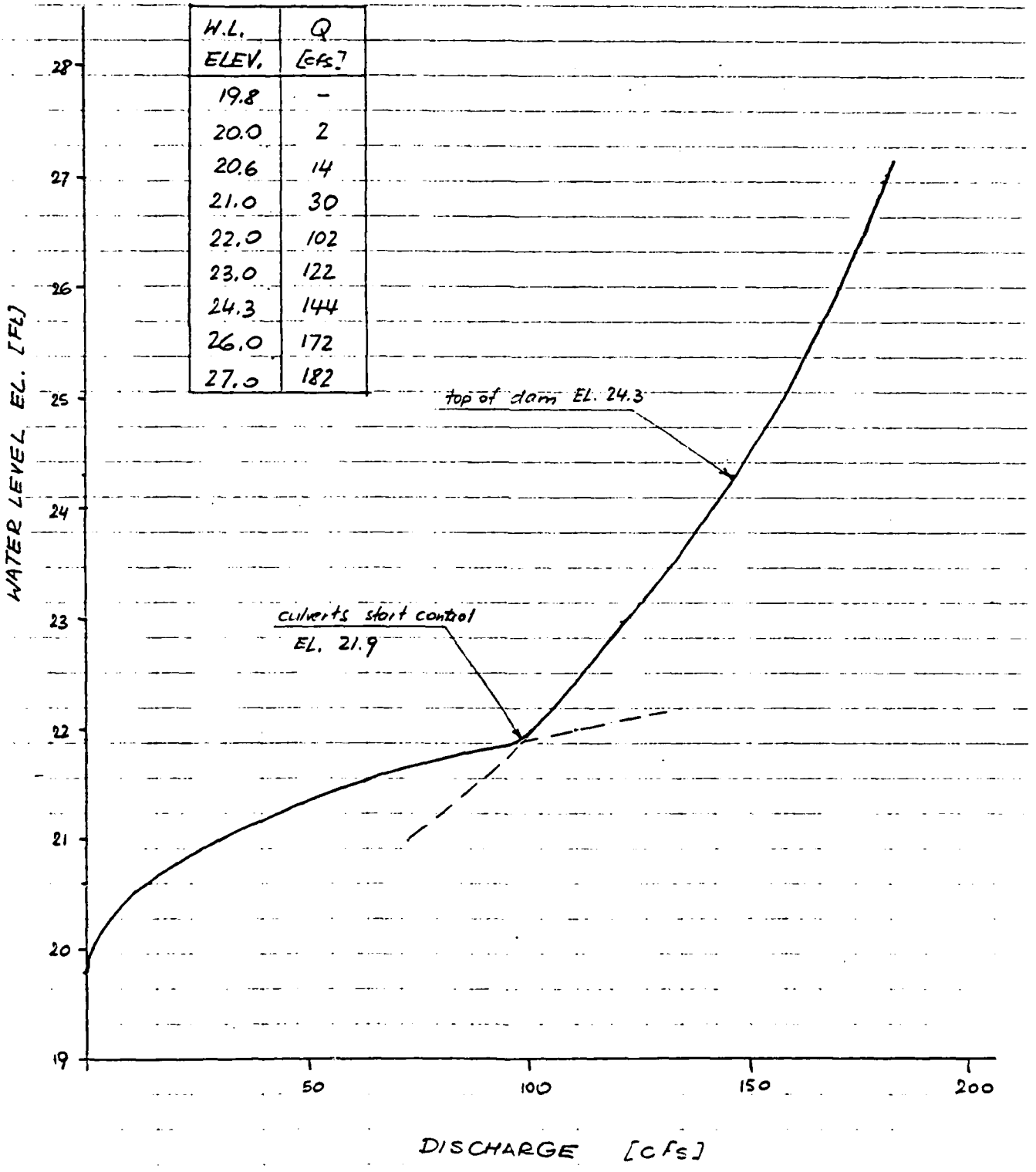
Sheet 10 of 12

Project 1132-06 SHAWS MILL POND DAM Made By _____ Date _____

Chkd By JG Date 4/10/81

STAGE DISCHARGE CURVE

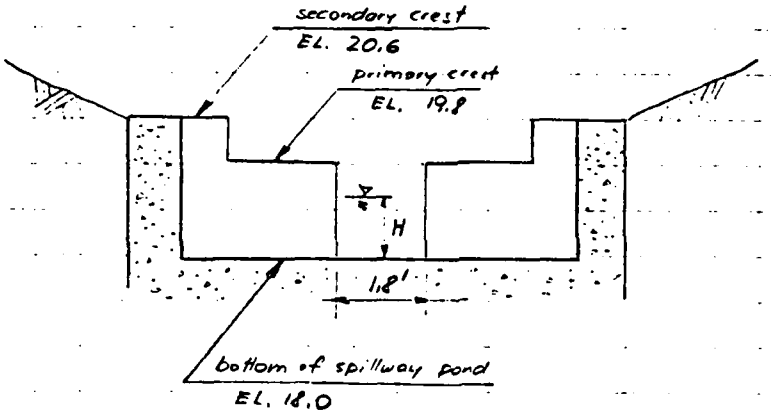
W.L. ELEV.	Q [cfs]
19.8	-
20.0	2
20.6	14
21.0	30
22.0	102
23.0	122
24.3	144
26.0	172
27.0	182



DRAWDOWN

THE DISCHARGE FOR DRAWDOWN WILL BE CALCULATED BY ASSUMING WEIR FLOW OVER THE STOPLOGS AS THEY ARE REMOVED. THE WEIR IS A SHARP-CRESTED WEIR WITH LENGTH 1.8' AND C = 3.32

FOR AVERAGE DISCHARGE, ASSUME H = 1.0'



$Q = C L H^{3/2}$

$Q = 3.32 \times 1.8 \times 1^{1.5}$

$Q = 6$ cfs

Q = discharge [cfs]
C = 3.32
L = eff. length of spillway [Ft]
H = head on spillway [Ft]

TIME OF DRAWDOWN

Drawdown from W.L. EL. 20.0 Feet to W.L. ELEV. 18.0 Feet

Storage volume at W.L. EL. 20.0 = 87 [Ac-ft]

at W.L. EL. 18.0 = - 67 [Ac-ft]

Effective storage volume of drawdown 20 [Ac-ft]

Assume inflow = 2.0 [cfs]

$$Td = \frac{\text{Storage [Ac-ft]}}{\text{Ave. discharge} - \text{Inflow [cfs]}} \times \frac{43560}{3600}$$

$$Td = \frac{20}{6 - 2} \times \frac{43560}{3600} = 60.5 \text{ Hr.}$$

$$= 2.5 \text{ days}$$

HEC - 1 - DAM PRINTOUT

Overtopping Analysis

```
1A1                          NATIONAL DAM SAFETY PROGRAM
A2                           SHAW MILL POND DAM, NEW JERSEY
A3                           100 YEAR STORM ROUTING
R     300        0       30                                    0       0       4
B1      5
J       1        1       1
J1      1
K       0    LAKE                                0       0       1
K1         INFLOW HYDROGRAPH TO SHAW MILL POND DAM
M       0        2     3.5                   3.5       0                       1
O      48
O1  0.04     0.04    0.04    0.04    0.04    0.04    0.04    0.04    0.04    0.04
O1  0.04     0.04   0.045   0.045   0.045   0.045    0.09    0.09    0.09    0.09
O1  0.09     0.09   0.095   0.095    0.15    0.15    0.15    0.15    0.40    0.40
O1   1.5      1.5    0.20    0.20    0.15    0.15   0.095   0.095    0.09    0.09
O1 0.045    0.045   0.045   0.045    0.04    0.04    0.04    0.04
T                                                     1.5    0.15
W2              2:5
X    -1.5   -0.05     2.0
K       1      DAM
K1        ROUTE DISCHARGE THRU DAM
Y                                     1       1
Y1      1                                             -19.8      -1
Y4   19.8     20.0    20.6    21.0    22.0    23.0    24.3    26.0    27.0
Y5      0        2      14      30     102     122     144     172     182
$A      0       29     107     310
$E     11       20      30      40
$$   19.8
$D   24.3     2.63     1.5     470
K      99
```

NATIONAL DAM SAFETY PROGRAM
SHAW MILL POND DAM, NEW JERSEY
100 YEAR STORM ROUTING

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	30	0	0	0	0	0	4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 1 LRTIO= 1

RTIOS= 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO SHAW MILL POND DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	IRSDA	IRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	3.50	0.00	3.50	0.00	0.000	0	1	0

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 2.50

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

0
END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	7.20	4.21	2.98	20360.
										(183.)	(107.)	(76.)	(576.53)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE DISCHARGE THRU DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-20.	-1

STAGE	19.80	20.00	20.60	21.00	22.00	23.00	24.30	26.00	27.00
FLOW	0.00	2.00	14.00	30.00	102.00	122.00	144.00	172.00	182.00
SURFACE AREA=	0.	29.	107.	310.					
CAPACITY=	0.	87.	726.	2723.					
ELEVATION=	11.	20.	30.	40.					

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
19.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
24.3	2.6	1.5	470.

PEAK OUTFLOW IS 2064. AT TIME 18.50 HOURS

1 ********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 / RATIOS APPLIED TO FLOWS
				1.00
HYDROGRAPH AT	LAKE	3.50	1	2236.
		(9.06)		(63.33)(
ROUTED TO	DAM	3.50	1	2064.
		(9.06)		(58.43)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	19.80	19.80	24.30
	STORAGE	81.	81.	268.
	OUTFLOW	0.	0.	144.

	RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
	1.00	25.63	1.33	350.	2064.	8.50	18.50	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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APPENDIX 5

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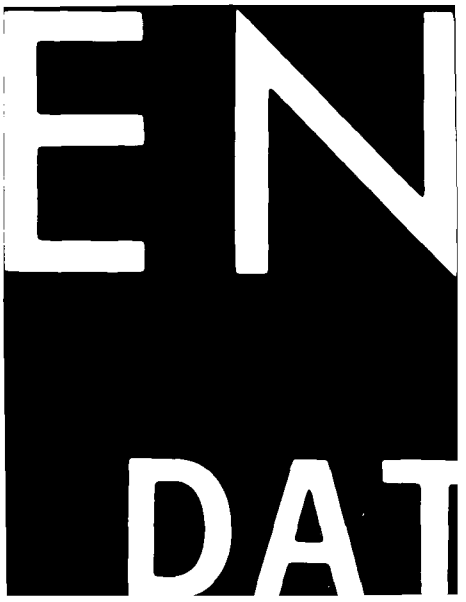
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